Time: 3 Hours **Total Marks : 80**

Note: (1) All questions are **compulsory**
(2) Use of statistical tables and scientific calculators wherever required is permitted
(3) Graphs / Figures if any to be drawn on the answer sheet itself

Q.1 A) Answer the following (**any ten**) 20

i) Suppose a population is normally distributed (and you are a member of the population) . If you have a standard score of Z = 2, what percentage of the population has scores greater than you?

ii) Name any two softwares used for statistical analysis

iii) Give two suitable examples each for Nominal and ordinal data

iv) Name two parametric tests for hypothesis testing

v) The propensity of ureteral stents to fracture in vivo is reported as 0.5 % Calculate the probability that one ureteral will fracture in-vivo in a clinical trial of 500 pateints

vi) Write two salient features of Bionomial distribution Curve.

vii) Give two applications of regression analysis

viii) Suppose an independent environmental group computes the gas mileage for a random sample of 100 new models of the same car make and model in order to make a statement about the gas mileage of this make and model. The results on these 100 cars include the following summary statistics:
Sample mean mileage, 31.4 mpg
Sample standard deviation: 1.2 mpg
Sample median: 31.2 mpg
Calculate 95 % Confidence Interval for the mean car mileage

ix) What is log normal distribution.

x) State Baye's Theorem and state its one application

xi) Manufacturer of Paracetamol tablets states mean content of drug in a tablet to be 50.2 mg with variance of 2.5 mg^2. What percentage of tablets contain less than 50 mg?

Q.1 B) Multiple choice questions, select and write an appropriate option correctly : (5)

i) The products of naturalistic observation are best described in terms of

(a) explanation.
(b) theory.
(c) prediction.
(d) description.

ii) What is wrong about non-parametric tests or significance?
(a) They are distribution-free techniques of analysis
(b) They assume that groups should be homogeneous
(c) They make no assumption about the parameters
(d) They do make certain assumptions, but these are fewer and less stringent.

iii) What is the meaning of Null Hypothesis?
(a) Difference between two parametric mean is zero
(b) The difference is due to error in sampling
(c) Both of them
(d) None of these

iv) ANOVA does NOT assume that
(a) The treatment groups are selected at random from the same population.
(b) The adjusted scores within groups have normal distibution.
(c) The treatment groups are homogeneous.
(d) The treatment groups are drawn from a larger population.

v) Which of the following is the least helpful to locating and analyzing problems?
(a) Exploring the literature in an area of interest
(b) Discussing with the research guide
(c) Examining every day experiences
(d) Critical analysis of the existing theories and practices.

Q.2 A) Write a note on Hypothesis testing (4)

Q.2B) It is postulated that runners are able to run until they collapse because they secrete beta-endorphin. To test this hypothesis Beta endorphin levels (pmol/l) in marathon runners is estimated in control runners and collapsed runners and the data is as follows (4)

Patient Number	1	2	3	4	5	6	7	8	9	10
Control Runners	14	20	50	17	45	35	37	16	26	24
Collapsed Runners	109	70	47	36	130	108	29	55	42	118

Apply Mann-Whitney test and state if the collapsed runners indicate higher levels of beta endorphin.

Q.2C) State various graphical presentations and give salient features of any two (3)

OR

Q.2C) Complete the following table created for results of vitamin C content of **three** varieties of Tomatoes (3)

Source	Degrees of freedom	Sum of Squares	Mean sum of squares	F
Between varieties	??	120.87	??	??
Within varieties	27	??	??	
Total	??	173.7		

Q.3 A) An examination evaluating cognitive knowledge in basic Pharmacology was mailed to a random sample of all Pharmacists in a particular state. Those responding were classified as either hospital or community pharmacists. The examination results were

	Hospital Pharmacists	Community Pharmacists
Mean score	82.1	79.9
Standard deviation	12.3	14.5
Number of respondents	129	142

Do the mean results of the two types of Pharmacists differ significantly at 5%. (4)

Q.3 B) Write a brief note on Latin square design and factorial design. (4)

OR

Q.3 B) Three physicians were selected for a study to evaluate length of stay at hospital for patients undergoing a major surgical procedure. Five records of length of stay in days per physician were randomly selected from patients treated in the past year. Use ANOVA to conclude whether there was a significant difference, by physician, in the length of stay of these patients. (4)

Physician A	Physician B	Physician C
9	10	8
12	6	9
10	7	12
7	10	10
11	11	14

Q.3 C) With early detection, the probability of surviving a certain type of cancer is 0.6. During a screening program, eight individuals were detected with early manifestations of the cancer.

Turn Over

What is the probability that (3)

i. All eight will survive

ii. At least two will survive

OR

Q.3 C) Write a note on Normal distribution. Give two possible examples of normally distributed data. What is Central Limit Theorem? (3)

Q.4 A) Write a note on different sampling methods. (4)

Q.4 B) A new analytical method is to be compared to an old one. The experiment is performed by a single analyst. She selects four batches of product at random and obtains the following results.

Batch	Method 1	Method 2
1	4.81	4.93
2	5.44	5.43
3	4.25	4.30
4	4.35	4.47

Perform a paired t-test to determine whether the two methods give different results on the average at 10% level of results. (4)

Q.4 C) Write a note on Wilcoxon Sign Rank test. (3)

OR

Q.4 C) In a drug stability study the following data were obtained. Calculate the linear regression Equation (3)

Time (months)	0	1	3	9	12	18
Content (mg)	2.56	2.55	2.50	2.44	2.4	2.31

Q.5 A) Discuss any two types of research in detail (4)

B) How do you write a scientific research paper for publication? Explain the aspects to be stressed upon during writing research paper (4)

C) What are trademarks? Explain in brief (3)

Turn Over

Q.6 A) Write a short note on (4)

i) Objectives of research

ii) Inquiries in form of questionnaire.

B) What are skills for oral presentation and give different types of visual aids (4)

C) Discuss the importance of statistics in research (3)

_____